Project Description

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Project Understanding

The Mendocino City Community Services District will complete an inventory of known and potential water quality threats to the area's ability to support a sustainable water supply. The study will assemble a comprehensive dataset of groundwater quality. Using this information, MCCSD will analyze the regional water system using both an existing groundwater flow model and geographical information system software and classify the water quality threat to areas of the District. Based on the study, an assessment of economic, water supply, and environmental resource impacts will be prepared.

Problem Statement

The Mendocino City Community Services District (MCCSD) service area encompasses the Town of Mendocino which has a population of approximately 1,000 residents and covers a one square mile area (Figure 4-1). This area is predominantly characterized by residential and tourist based commercial development.

The proposed project is to evaluate water quality conditions and threats in the Mendocino area. Since there is no municipal water system in Mendocino, and property owners rely on privately owned wells, a source water assessment to identify potential sources of groundwater contamination is not required. The project would include an inspection/sanitary survey of District wells and a groundwater quality assessment. This would be a GIS project that would create water quality and groundwater vulnerability map layers.

Mendocino's groundwater supply is suspected to be vulnerable to contamination due to the shallow nature of the groundwater and that the town sits on top of the bulk of the recharge area for the aquifer. In addition, a number of the wells still used in Mendocino are the old unsealed well construction that is vulnerable to surface contamination as well (Figure 4-1). Because the wells are used for domestic purposes by individual well owners they are not required to have water quality testing. The primary of objective of this study is to initiate water quality monitoring in Mendocino with the goal of maintaining a safe water supply for the District.

Background

The Town of Mendocino is located on the Mendocino Headlands along the Pacific Coast (Figure 4-1). The Mendocino Headlands form a broad peninsula bounded by sea cliffs that range from in height from 40 to 100 feet. This physical setting presents a challenge in managing groundwater resources. The limited groundwater resources have led to water shortages during the dry summer months for residents with marginal wells especially in drought years (Questa and ETIC, 2004, Kennedy/Jenks, 2006).

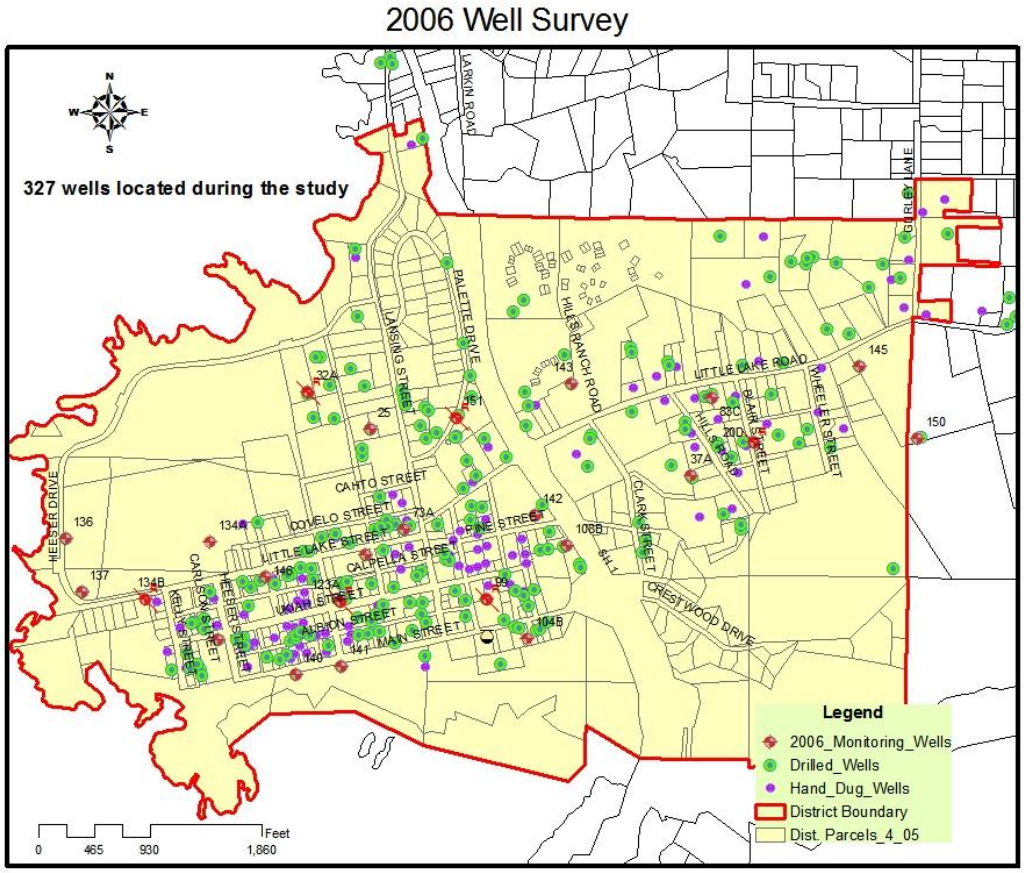

Figure 4-1 – Study area map showing density of domestic water supply wells within the Mendocino City Community Services District. Map also shows that a significant number of hand-dug wells are still used within the District.

Mendocino City Community Services District

The Mendocino City Community Services District (MCCSD) service area encompasses the Town of Mendocino which has a population of approximately 1,000 residents and covers a one square mile area (Figure 4-1). This area is predominantly characterized by residential and tourist based commercial development.

MCCSD was established in 1971 as a first step towards addressing the community's wastewater and water issues. The first action of the district was to implement a wastewater treatment plant and collection system in 1975. MCCSD treats approximately 35 million gallons of wastewater per year. Tertiary treated wastewater is discharged to the Pacific Ocean via an ocean discharge structure located approximately 996 feet away from the shoreline. Tertiary treated wastewater is also used as irrigation water on the Mendocino High School.

In 1990, MCCSD took over groundwater management authority from Mendocino County. As part of its groundwater management, MCCSD has developed a groundwater withdrawal program which limits groundwater extraction. The Groundwater Management Plan contains a

Groundwater Extraction Permit Ordinance which is used to establish groundwater allotments. These allotments are based on the size and type of development on the parcel. A hydrological study must be performed prior to the issuance of a groundwater extraction permit for new development that evaluates whether adequate water is available and pumping does not adversely affect neighboring wells.

Groundwater Conditions

The Mendocino Headlands are underlain by the Tertiary Franciscan Complex (Franciscan) overlain marine terrace deposits (DWR 1985, Questa and ETIC, 2004). The local groundwater occurs in this complex system of a fractured Franciscan bedrock aquifer overlain by thin marine terrace deposits. The distribution of the terrace deposits plays a key role in maintaining groundwater levels by acting as a reservoir that recharges the underlying fractured Franciscan bedrock throughout the year (DWR, 1985, Questa and ETIC, 2004, Kennedy/Jenks, 2006). A significant component of the discharge from the Mendocino Headlands aquifer is to springs located in the surrounding cliffs along the Pacific Ocean.

Limited groundwater resources in the Mendocino Headlands have led to severe water shortages during the dry summer months for residents with marginal wells. MCCSD has been proactive in its groundwater management role. MCCSD's current groundwater management policies are to promote water conservation measures, to increase the use of reclaimed water to reduce groundwater extraction, and to actively collect and analyze groundwater conditions on a regular basis. MCCSD's ongoing groundwater management activities include collecting monthly groundwater levels from a network of 24 monitor wells from across the district to support the ongoing groundwater evaluations.

Water Usage

Groundwater production in Mendocino is primarily from individual privately-owned wells completed in the fractured Franciscan bedrock. Well depths typically range between 40 to 200 feet. Most new wells in the area range from 100 to 150 feet deep. However, there still exist a number of old hand dug wells that are generally 20 to 40 feet deep (DWR, 1985, Questa and ETIC, 2004, Kennedy/Jenks, 2006).

Many of the domestic water supply wells currently used in Mendocino are unsealed hand dug wells that are not considered to meet current well standards by Mendocino County DEH (1994) or the State of California Department of Water Resources (1981, 1991) due to the high risk of contamination. This is because unsealed hand dug wells are susceptible to contamination because poor quality water may enter the well from the surface or shallow subsurface. Current well standards require a minimum 20-foot well seal typically made of concrete provides a physical barrier that blocks poor quality or contaminated water from entering the well from the surface or shallow groundwater.

Study Description

The study is intended to develop a technically feasible and comprehensive assessment of the water quality risks to the long-term sustainability of the Mendocino area.

- Water Quality Sampling
- Groundwater Threat Assessment
- Groundwater Model Analysis
- Groundwater Protection Plan

The purpose of the water quality sampling is to develop a baseline of groundwater quality in the District. The District will sample the 24 monitoring wells used for its groundwater management monitoring. These include both deep and shallow wells that are located near to developed areas of town and others located in areas such as the State Park that will provide background conditions. Wells would be sampled for general constituents and potential water quality contaminants including nitrates, bacteria, metals, and various chemicals used as fuels, solvents and other commonly used contaminants of concern. Wells would be sampled twice, one in the spring during high groundwater conditions and once in the late summer during low groundwater conditions.

For the Groundwater Threat Analysis, a comprehensive dataset will assembled of known or potential contamination threats to water quality in a common geographical information system (GIS) platform. Data to be assembled include known regulated environmental sites, business activities, location of sewer lines, use of recycled water, stormwater runoff and other possible threats to water quality. The groundwater threat assessment based on a source–pathway–receptor approach would be developed. A modified version of the DRASTIC methodology developed by the US Environmental Protection Agency will used to map the intrinsic and specific threats to groundwater quality. The GIS based analysis will enable MCCSD to screen and rank the relative vulnerability of the local groundwater to contamination and estimate the financial vulnerability to groundwater production infrastructure posed by groundwater contamination.

The existing Mendocino Headlands groundwater model will be used to delineate potential flowpaths through the aquifer to better understand the flowpaths that potential contaminants would take. First, the existing model will be updated with new data from 2008 through 2012 using the MCCSD groundwater management database. The purpose of the flowpath analysis is to simulate the movement of particles under various aquifer and climatic conditions (e.g. wet, average and drought years). This will be used to identify those areas at the threat of potential contamination from known or potentially contaminating activities as the technical basis for the groundwater protection plan.

The existing model is based on MODFLOW. A series of model scenarios will be run to evaluate groundwater quality. This will be conducted using particle tracking code MODPATH and the flow and transport code MT3D in conjunction with the existing MODFLOW-based Mendocino Headlands groundwater model to simulate the movement of possible contamination based on a flow system. MODPATH will be used to evaluate the direction and the travel time for various

parts of the Mendocino Headlands aquifer. The transport code MT3D will be used to analyze the attenuation factor of potentially contaminating activities through mixing and movement of the constituent in the aquifer. MT3D will be then used to calculate the mixing and movement of the discharged effluent in the shallow aquifer as a percentage of the initial source strength. This is important to evaluate the potential risk of contamination to the drinking water supply.

The Groundwater Protection Plan will categorize and prioritize the identified water quality threats and potentially contaminating activities found during the completion of Tasks 1, 2 and 3, and evaluate practices related to salt and nutrient management. It will be critical to distinguish between historical mismanagement and current practices early in the Groundwater Protection Plan and to acknowledge that localized degradation sources may be out of the District's control.

The Groundwater Protection Plan will address the key issues identified in the approach and will integrate the elements discussed in the preceding work scope items. There are essentially two parts to the Groundwater Protection Plan: (1) recommendation of best management practices, and (2) development of a groundwater monitoring program. Based on the vulnerability analysis, a groundwater protection plan will be developed to regularly monitor groundwater quality going forward, and provide guidelines on future well installation, and provide a plan on how to address water quality concerns for wells that are not currently up to well standards.

Relationship to Groundwater Management Plan Goals

The proposed project is entirely consistent with the goals and objectives of the MCCSD GWMP. The GWMP's goal is to ensure a viable groundwater resource for beneficial uses to provide a reliable and safe water supply. The 2012 GWMP does not address groundwater quality, so the groundwater quality assessment project will fill that gap. However, this assessment is clearly at the heart of the GWMP goal. The local well owners want to understand if the potential impacts of the various contaminants in the local water supply. Based on identifying and prioritizing these threats, the District will have an important tool for near and long-term planning to mitigate against these potential impacts.

Public Outreach

A procedure is in place to inform the District's groundwater users and the general public about the scope and objectives of the proposed project. Prior to the commencement of the project, the District will publish a press release in the Mendocino Beacon, which describes the scope of and the need for the project. An informational letter will be sent to all property owners in the District to notify them of the need for the project and the schedule of tasks that may affect them. A brief description of the project will be added to the District's website. Regular update reports on the project progress will be added to the monthly MCCSD Board Meetings agenda to keep the Board and the public informed. The Project results will be disseminated at the end of the grant project.

Following the completion of the grant tasks, a Town Meeting will be held to inform the public of the accomplishments of the project. The Town Meeting (a Special MCCSD Board Meeting) will

be held at the Mendocino Performing Arts Center to discuss the Project findings. Prior to the meeting, representatives from the Mendocino County Water Agency, the Mendocino County Department of Environmental Health, the DWR contact person, and the public will be invited to attend and ask questions about the Project. A Town Meeting press release will be released to the local radio stations and will be published in the Mendocino Beacon to notify the public of the upcoming meeting. At the Town Meeting, the District's consultant will give a Power Point presentation describing the various accomplishments of the Project. Copies of the final report will be available at the Town Meeting and at the District Office. Water quality and vulnerability assessment geographic information system (GIS) map layers will be added to the District's Website. The final project report will be disseminated to the Mendocino County Water Agency, the Mendocino County Department of Environmental Health, and the DWR.

Collaboration with Public Agencies

MCCSD works collaboratively with other local public agencies to manage the groundwater resources in Mendocino.

Prior to 1990, the Mendocino County Department of Environmental Health regulated the groundwater resources in Mendocino. Following the adoption of CWC 10700-10717, Mendocino County Health Department and MCCSD signed MOU 90-113. From that time forward, the District regulated of groundwater resources in the District. The County retained its jurisdiction as to all standards for the construction, repair, or destruction of wells, while MCCSD regulated groundwater pumping from wells within their boundaries by issuing groundwater extraction permits and monitoring groundwater withdrawals.

Prior to issuance of a groundwater extraction permit for new development, changes of use, or expansion of an existing use, MCCSD requires a property owner to perform a hydrological study to prove there is adequate groundwater for the proposed project and that the additional groundwater extraction will not adversely affect adjacent wells or the aquifer. MCCSD requires that the hydrological studies are reviewed by either a hydrologist from a private engineering firm or the Mendocino County Water Agency (MCWA).

The District is also collaborating with the MCWA in CASGEM. MCWA is the Monitoring Entity, and has developed a monitoring plan to track current groundwater levels in the county to help understanding and manage the basin. MCCSD is in the process of becoming an associate user. As an associate, MCCSD will provide the MCWA with groundwater monitoring data regularly collected by the District including groundwater data acquired during the grant project.

Ongoing Project Data Evaluation and Funding

Groundwater monitoring and well data collected by MCCSD personnel is periodically added to the District's geographic information system (GIS) and the Mendocino Groundwater Model. MCCSD personnel have received GIS training to allow staff to enter new and edit existing groundwater data in the GIS. The District's consulting hydrologist regularly updates the Mendocino Groundwater Model, which was developed with a Local Groundwater Assistance grant. After the completion of the grant project groundwater water quality monitoring data

will be regularly incorporated into the groundwater model by the District's consulting hydrologist to track changes in groundwater quality and potential threats to the water supply.

MCCSD has an annual Groundwater Management budget, which is funded by monthly Groundwater Management user fees. The District's Groundwater Management Plan and Programs and the Mendocino Groundwater Model are maintained with Groundwater Management fee revenue. Ongoing project groundwater quality monitoring will be funded by the Groundwater Management budget.

References

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Questa Engineering Corp. and ETIC Engineering, Inc. (Questa and ETIC), 2004, Final Report, Groundwater Modeling Study of the Mendocino Headlands, Mendocino, California, Report prepared for MCCSD, May, 2004.